PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-079641
(43)Date of publication of application : 22.03.1996

(51)Int.Cl. H04N 5/44

(21)Application number : 06-207378
(22)Date of filing : 31.08.1994

(71)Applicant : TOSHIBA CORP
(72)Inventor : SENBON HIROYUKI
YASUKI SEIJIROU
TASHIRO SHIGERU

(54) TELEVISION RECEIVER

(57)Abstract:
PURPOSE: To suppress the increase of a circuit scaleto cope with plural broadcast services and to improve extendability.
CONSTITUTION: At the time of receiving digital broadcasta de-packet processing module 305an MPEG video module 307 and an MPEG audio module 308 are used. Even at the time of receiving digital CATV broadcastingthe de-packet processing module 305the MPEG video module 307 and the MPEG audio module 308 are used. A de-packet processing and an MPEG decoding processing are made into modules and they are connected by a bus 302 to share them. Thusthe increase of the circuit scale is suppressed. Furthermorea function can easily be extended/changed by the additional change of the module.

CLAIMS

[Claim(s)]
[Claim 1]A television set comprising:
Two or more functional modules which realize two or more functions required for transmission and reception of two or more broadcast waves and a communication wave.
They are time sharing or a bus structure for using it independently about said two or more functional modules.

[Claim 2]The television set according to claim 1wherein said functional module is what realizes a processing capability common to transmission and reception of two or more waves in said two or more broadcast waves and a communication wave.
[Claim 3]The television set according to claim 1wherein said functional module is constituted by reception means which receives said two or more broadcast waves

or said communication wave.
[Claim 4]The television set according to claim 1wherein said functional module is constituted by transmitting means which transmits said broadcast wave or said communication wave.
[Claim 5]Claim 3 to which said functional module is characterized by a controllable thing by a host CPUor a television set of any one description of four.
[Claim 6]The television set according to claim 1wherein abnormal-conditions / recovery processing is possible for said functional module.
[Claim 7]The television set according to claim 6 which said functional module is controllable by a host CPUand is characterized by the ability to change the contents of processing of said abnormal-conditions / recovery processing.
[Claim 8]The television set according to claim 1wherein error correction processing is possible for said functional module.
[Claim 9]The television set according to claim 8 which said functional module is controllable by a host CPUand is characterized by the ability to change the contents of processing of said error correction processing.
[Claim 10]The television set according to claim 1wherein said functional module is constituted by decoding means of an MPEG system.
[Claim 11]The television set according to claim 10 which said functional module is controllable by a host CPUand is characterized by the ability to change the contents of processing of said decoding processing.
[Claim 12]The television set according to claim 1wherein said functional module can change a digital bit string into a predetermined data row.
[Claim 13]The television set according to claim 12 which said functional module is controllable by a host CPUand is characterized by the ability to change the contents of processing of a conversion process to said predetermined data row.
[Claim 14]The television set according to claim 1wherein said functional module is constituted by decoding encode means of an NTSC signal.
[Claim 15]The television set according to claim 14 which said functional module is controllable by a host CPUand is characterized by the ability to change the contents of processing of encoding decoding.
[Claim 16]A television set comprising:
A receiving module which can receive two or more broadcast waves and communication waves.
A recovery module which restores to an input signal from this receiving moduleand outputs demodulated data.
A conversion module which changes said demodulated data into a predetermined data row.
A decryption module which decrypts a data row from this conversion moduleAn image output module which projects a picture based on decoding data from this decryption moduleA voice response module which outputs a sound based on decoding data from said decryption moduleAn abnormal-conditions module which modulates predetermined send dataand a transmitting module which transmits an output of this abnormal-conditions module as said broadcast wave or a

communication waveA control means which changes the contents of processing of said receiving modulea recovery modulea conversion modulea decryption modulean image output modulea voice response modulean abnormal-conditions moduleand a transmitting module according to said two or more broadcast waves or a communication wave.

[Claim 17]The television set according to claim 16wherein said receiving module and a transmitting modulesaid image output moduleand a voice response module are connected by bus.
[Claim 18]The television set according to claim 16wherein said receiving module and a transmitting modulesaid recovery moduleand an abnormal-conditions module are connected by bus.
[Claim 19]The television set according to claim 16wherein said recovery module and an abnormal-conditions moduleand said conversion module are connected by bus.
[Claim 20]The television set according to claim 16wherein said conversion module and said decryption module are connected by bus.
[Claim 21]The television set according to claim 16wherein said decryption modulesaid image output moduleand a voice response module are connected by bus.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001][Objects of the Invention]
[Industrial Application]This invention is ability ready for receivingand it relates two or more broadcast waves to the television set which can communicate bidirectionally.
[0002]
[Description of the Prior Art]Nowcolor broadcast of NTSC system is performed in Japan. The second generation EDTV (Extended Definition TV) broadcast using digital art is also due to start this present NTSC broadcast high-definition-izing and for the purpose of high-quality-sound-izing from 1995. In present NTSC broadcastmultiplex [of the digital data of a teletext] is carried out to the vertical section blanking period of the broadcast waveand not only the usual broadcast but viewing and listening of a teletext is possible. New broadcast of data broadcasting using the voice channel of BS (satellite broadcasting)FAX broadcastetc. is also performed in recent years.
[0003]Conventionallysince a memorydigital LSIetc. were expensiveimplementation of such various broadcast services was difficult. Howeverit becomes easy with progress of memory technology to display digital data on a displayand not only broadcast but various broadcast services can usually be used now. Progress of digital art and semiconductor technology is remarkableand has had big influence on

the field of broadcast and communication. Digitization of a picture progresses and digital television (TV) broadcast also began to be considered.

[0004]In digitization of a picturecompression technology is indispensableand various standardization proposals are examined. For examplethe international standardization of MPEG(Moving Picture Experts Group) 2 method is progressing as a digital compression encoding system which compresses and transmits video. A video signal is coded in MPEG 2using complexly DCT (Discrete Cosine Transform) conversioninterframe predictive codingrun length codingand entropy code modulation. The graphical data compression which used this MPEG 2 as the base also in digital TV broadcasting is considered. MPEG 2 is used also in CATV etc. and it makes it possible to give its service simultaneously using many channels by compressing video with an MPEG2 system in the digital CATV system which performs bidirectional data communications. By compression of an MPEG 2 standardthe compression encoding which maintained high-quality-sound-izing and high definition-ization becomes possible.

[0005]By the waya sound and an image tend to be treated integrative by establishment of image compression technologysuch as MPEG 2and the multimedia service which can provide various kinds of information services also by a picture according to a user's demand is also going to be developed in recent years. For examplethe broadcasting format which unifies and treats a picturea soundand various databi-directional CATVetc. are examined. It is possible to use a television set as a terminal unit for enjoying these various services in an ordinary home.

[0006]Drawing 21 is a block diagram showing the conventional television set which can receive present NTSC broadcast. Drawing 22 is a block diagram showing the encoder which generates an NTSC signal.

[0007]NTSC broadcast is explained by 141 ** 1 JI in full detail from 138 ** 1 JI of the "broadcasting format" (Japan Broadcast Publishing). R of the source picture obtained with a television camera or VTRrespectivelyGand B signal are inputted into the input terminals 1 thru/or 3 of the encoder shown in drawing 22. R and G which were inputtedand B signal are changed into a luminance signal (Y signal) and a color-difference signal (an I signala Q signal) by the matrix circuit 4respectively. A Y signal is delayed with the delay line 5and is given to the adder circuit 7. An I signal is delayed with the delay line 6and is supplied to the low pass filter (LPF) 8 for I signals. A Q signal is supplied to LPF9 for Q signals.

[0008]LPF8 for I signals band-limits the inputted I signaland it outputs it to the I signal modulator 10. LPF9 for Q signals band-limits the inputted Q signaland it outputs it to the Q signal modulator 11. The delay line 6 absorbs the difference of the delay which LPF9 produces from a cut off frequency being low rather than LPF8. The delay line 5 absorbed I and the time which processing of a Q signal takesand has doubled timing. It becomes irregular with the modulators 10 and 11respectivelyand the output signal of LPF 8 and 9 is supplied to the adder circuit 7and is added by the adder circuit 7 with a Y signal.

[0009]The career which the modulators 10 and 11 use is created based on the

output of the 3.58-MHz oscillator 12. The 3.58-MHz oscillator 12 gives the oscillation output whose frequency is 3.58 MHz to the -57-degree phase converter 13. -By the 57-degree phase converter 13the career of an I-axis is created and the modulator 10 is supplied. By carrying out 14-90 degrees of -90-degree phase converter phase shift of the I-axis careera Q-axis career is created and the modulator 11 is supplied.

[0010]The oscillation output of the 3.58-MHz oscillator 12 is supplied to the synchronizing signal generator 15. By carrying out dividing of the oscillation output of the oscillator 12the synchronizing signal generator 15 creates a composite synchronizing signaloutputs it to the adder circuit 7and generates the timing signal of a horizontal cycle and outputs it to the burst modulator 16. A 3.58-MHz oscillation output is given from the oscillator 12and the burst modulator 16 generates a burst signal in the timing of a timing signaland outputs it to the adder circuit 7.

[0011]The adder circuit 7 adds a burst signal and a composite synchronizing signal to the composite signal of a Y signaland I and a Q signalgenerates an NTSC signaland outputs it via the output terminal 17. In this waythe encoded NTSC signal is transmitted to each home as a high frequency television signal using a terrestrial waveBS waveor CS (satellite communication) wave.

[0012]On the other handin a receiverthe received high frequency television signal is given to the tuner which is not illustratedand the video signal of a predetermined channel tunes it init is changed into an intermediate frequency signaland is inputted into the input terminal 21 of drawing 21. The video detector 22 detects the tuned-in intermediate frequency signaland outputs the video signal of baseband to the chrominance subcarrier trap 23 and the band pass amplifier 24. As for a video signalby the chrominance subcarrier trap 23a color component is removed and a Y signal is extracted. This Y signal is given to the matrix circuit 26 via the delay line 25.

[0013]On the other handby the band pass amplifier 24a chrominance signal is separated from a video signal and the I signal synchronous detector 27the Q signal synchronous detector 28 and burst omissionand ****** 29 are supplied. Burst omission and ****** 29 sample a burst signal from the inputted signaland output it to the phase comparator 30. The 3.58-MHz oscillation output from the voltage controlled oscillator 31 is also inputted into the phase comparator 30. The phase comparator 30 compares the phase of 2 inputsand outputs the error signal based on phase contrast to the voltage controlled oscillator 31. By thisthe oscillation output of the voltage controlled oscillator 31 changes so that an error signal may be set to 0and from the voltage controlled oscillator 31the reproduction burst signal which carried out phase simulation to the burst signal is outputted. This reproduction burst signal is outputted to the I signal synchronous detector 27 as an I-axis career. By the -90-degree phase converter 32the 90-degree phase shift of the reproduction burst signal is carried outand it is outputted to the Q signal synchronous detector 28 as a Q-axis career.

[0014]The I signal synchronous detector 27 and the Q signal synchronous

detector 28 perform detection which used the I-axis career or the Q-axis careerrespectivelyand acquire an I signal and a Q signal. These I signals and Q signals are band-limited by LPF33 for I signalsand LPF34 for Q signalsrespectively. The band-limited Q signal is given to the matrix circuit 26and an I signal is given to the matrix circuit 26 via the delay line 35. By delaying a Y signal and an I signalrespectivelythe delay lines 25 and 35 coincide the timing of a Y signalan I signaland a Q signaland are supplied to the matrix circuit 26. The matrix circuit 26 performs matrix processing to the inputted signaland acquires RGand B signal. Thusan NTSC signal is decoded.

[0015]As mentioned abovein NTSC broadcasta picture is transmitted as an analog signal. On the other handin teletextmultiplex [of the digital signal] is carried out to the vertical blanking period of an NTSC signaland information is transmitted with digital data. This teletext is explained by the "broadcasting format" (from 244 pages of Japan Broadcast Publishing to 251 pages) in full detail.

[0016]Drawing 23 is a block diagram showing the conventional television set which can receive teletext. Drawing 24 is a block diagram showing the encoder which generates a teletext signal.

[0017]The video signal outputted from the TV program sending device 41 of the encoder shown in drawing 24 is supplied to the multiplexing device 42. The digital signal from the character program work device 43 which creates a teletext program is given to the bulk memory 44. The digital signal accumulated in the bulk memory 44 is read by the character program sending device 45and is sent out to the multiplexing device 42 as digital data of teletext. The multiplexing device 42 multiplexes the digital data of teletext at the vertical blanking period of the video signal from the TV program sending device 41and outputs it to the television transmitter 46. A teletext signal makes a broadcast wave the video signal and the audio signal from the TV program sending device 41 by which multiplex was carried outand the television transmitter 46 transmits from the antenna 47.

[0018]In a receiverthe broadcast wave which received with the antenna 51 of drawing 23 is supplied to the high frequency receive section 52. A broadcast wave is changed into the back intermediate frequency signal tuned in by the high frequency receive section 52and it restores to it to a baseband signal in the image demodulation section 53. The image demodulation section 53 and the chrominance-signal demodulation section 54 are the decoders and identical configurations of drawing 21and the video signal of baseband is changed into RGand B signal by the image demodulation section 53 and the chrominance-signal demodulation section 54. RGand B signal are supplied to the television picture tube 57 via a change / mixing parts 56 of the character decode part 55. In this waythe image based on the video signal from the TV program sending device 41 of the transmitting side is displayed on the display screen of the television picture tube 57.

[0019]On the other handthe output signal of the image demodulation section 53 is also given to the alphabetic signal treating part 58 of the **** decode part 55. The digital data of a teletext is separated and decoded by the alphabetic signal

treating part 58. The character generator 59 generates the dot data of a character based on decoding dataand gives them to the display memory 60. The display memory 60 arranges the dot data from the character generator 59 based on decoding dataand outputs them to the television picture tube 57 via a change / mixing parts 56. Therebyon the display screen of the television picture tube 57the character based on the output of the character program work device 43 of the transmitting side is displayed. Only a character can also be displayed on the display screen of the television picture tube 57and the character of a teletext can also be displayed in piles on an NTSC image.

[0020]The electronic sound generator 61 generates an audible signal based on the decoding data from the alphabetic signal treating part 58and is made to give and carry out output power of sound to the loudspeaker 62. The alphabetic signal treating part 58 is controlled based on the user's operation of the keypad 63.

[0021]By the wayin color broadcast of the NTSC system mentioned abovethe aspect ratio (aspect ratio) of a screen is 4:3. Howeverit became clear by setting the aspect ratio of a screen to 16:9 [more nearly oblong than present] that presence can be raised in process of research of HDTV (High Definition TV). Thenthe second generation EDTV broadcast which transmits the wide image of the aspect ratio 16:9 is consideredmaintaining compatibility with the present broadcast.

[0022]The aspect ratio supports [the effective scanning lines of a second generation EDTV signal] the portion of 16:9 of the center of a perpendicular direction of the present NTSC signal of 4:3. Thereforefor examplewhen an aspect ratio projects second generation EDTV broadcast with the television receiver for the present broadcast of 4:3the letter box display which has a non-picture area in the screen upper and lower sidesand has a main-picture area in the center will be performed. By adopting a letter box displaythere is an advantage that program materials are not cut even if it reproduces with the television set of NTSC system.

[0023]Sinceas for second generation EDTVthe aspect ratio makes only the portion of 16:9 of the center of the present NTSC signal of 4:3 effective scanning linesthe active scanning line per frame of the second generation EDTV signal to transmit becomes 360 to the active scanning line per frame of the present NTSC signal being 480. In the television receiver corresponding to a second generation EDTV method3 ->4 scanning conversion of these 360 effective scanning lines is carried out at the time of decodingand it returns to 480. Only by carrying out scanning line conversionsince resolution deteriorates rather than the present NTSC signallevel and the thing for improving resolution at the time of transmission for which a vertical reinforcement signal is multiplexed and transmitted have determined the second generation EDTV signal.

[0024]The system indicated about the encoder which generates such a second generation EDTV signal to Institute of Television Engineers of Japan technical report Vol.17No.65pp19-24and BCS'93-42 (Dec.1993) is proposed. Drawing 25 is a block diagram showing this encoder.

[0025]In this example4 ->3 scanning line conversion of the sequential-scanning

(progressive) signal of 480 lines / screen quantity (lph) is carried outand it changes into an interlaced-scanning (interlace) signaland transmits to a main screen period as a main screen signal. And it transmits to an up-and-down non-picture area period by making into a vertical reinforcement signal ingredient LD which is band-limited at the time of the ingredient VH lost by the band limit for preventing generating of the clinch distortion by scanning line conversionand interlaced-scanning conversionand is lost.

[0026]In drawing 25R of a source pictureGand B signal are inputted into the input terminals 71 thru/or 73respectively. Such RGand B signal are changed into a Y signalan I signaland a Q signal by the matrix circuit 74. A Y signal is given to the 4->3 conversion circuit 76 of the vertical treating part 75and scanning line conversion is carried out to the signal of 360lph from the signal of 480lph. SSKF(Symmetric Short Kernel Filter)77 which constitutes the vertical treating part 75and 78 function as vertical LPF and vertical HPFrespectivelyand divide into a vertical low-pass ingredient and a vertical high-frequency component the luminance signal which carried out scanning line conversion. The PI conversion circuit 79 of the vertical treating part 75 changes a vertical low-pass ingredient into an interlaced scanning signaland supplies it to the letter box conversion circuit 81 as a main screen signal of 180lph. The PI conversion circuit 80 of the vertical treating part 75 changes a vertical high-frequency component into an interlaced scanning signaland supplies it to the multiplex circuit 82 as vertical time high-frequency component LD of 180 thru/or 360lph.

[0027]On the other handthe Y signall signaland Q signal from the matrix circuit 74 are given to the prefilter 83. The prefilter 83 band-limits the inputted signal. The Y signal from the prefilter 83 is given to the vertical high-frequency component treating part 84. The vertical high-frequency component treating part 84 is constituted by the V shifter 85the 4->3 conversion circuit 86and the PI conversion circuit 87. After the frequency shift of the vertical high-frequency component of a Y signal is carried out to vertical low-pass by the V shifter 85it is changed into the vertical high-frequency component of 360 thru/or 480lph by the 4->3 conversion circuit 86and is further changed into an interlaced scanning signal by the PI conversion circuit 87. The vertical high-frequency component of 60lph is supplied to the multiplex circuit 82 as a VH' signal per this 1 field.

[0028]The Y signal from the matrix circuit 74 is also given to the motion detection circuit 88. The motion detection circuit 88 detects a motion of a pictureand outputs a motion detection signal to the multiplex circuit 82. When it is shown by the motion detection signal from the motion detection circuit 88 that a picture is Still Picture Sub-Divisionthe multiplex circuit 82 carries out multiplex [of VH' signal and the LD signal]and outputs them to the letter box conversion circuit 81When it is shown that it is an animationonly LD signal is outputted to the letter box conversion circuit 81.

[0029]The letter box conversion circuit 81 assigns the main screen signal from the PI conversion circuit 79 during the main screen of middle of the screenby making the output of the multiplex circuit 82 into a vertical reinforcement signalis

assigned and carries out multiplex to the non-picture area period of the screen upper and lower sides. After PURIKO ming processing is carried out by the PURIKO ming circuit 88the main screen signal from the letter box conversion circuit 81 is band-limited to 0 thru/or 4.2 MHz by LPF89and is given to the terminal a of the switch 92 via the multiplex circuit 90. PURIKO ming processing is for forming a hole in the multi-frequency field of HH' signal mentioned later. The vertical reinforcement signal (LD/VH') from the letter box conversion circuit 81 is given to the fsc modulation circuit 91and the fsc modulation circuit 91 modulates a vertical reinforcement signal using a chrominance subcarrierand it outputs it to the terminal b of the switch 92. A vertical reinforcement signal is compressed into one third by the time base direction in the letter box conversion circuit 81.

[0030]In second generation EDTV broadcastin order to improve horizontal resolutionthe not less than 4.2-MHz ingredient which cannot be transmitted in the present broadcast bands is also transmitted. Namelyafter carrying out scanning line conversion of the luminance-signal level high-frequency component from the prefilter 83 by the 4->3 conversion circuit 93by the PI conversion circuit 94it changes into an interlaced scanning signal and outputs to the letter box conversion circuit 81 by making the luminance-signal level high-frequency component of 180lph into HH signal. The letter box conversion circuit 81 assigns HH signal during the main screenand gives it to the hole multiplex circuit 95. The hole multiplex circuit 93 carries out the frequency shift of the HH signal to a chrominance subcarrier in the Fukinuki ** hole which is a conjugate frequency domaingives it to the multiplex circuit 90 as a HH' signaland it carries out multiplex to a main screen signal.

[0031]On the other handI from the prefilter 83 and a Q signal are supplied to the 4->3 conversion circuits 96 and 98respectively. The 4->3 conversion circuits 96 and 98 carry out scanning line conversion of I and the Q signalrespectivelyand output them to the PI conversion circuits 97 and 99. I and a Q signal are changed into an interlaced scanning signal by the PI conversion circuits 97 and 99and are supplied to LPF100 and 101 via the letter box conversion circuit 81respectively. LPF100 and 101 band-limit I and a Q signal to low-pass [1.5 MHz or 0.5 MHz]respectivelyand output them to the IQ modulation circuit 102. Quadrature modulation of I and the Q signal is carried out by the IQ modulation circuit 102they are given to the multiplex circuit 90and multiplex is carried out to the Y signal of a main screen in the multiplex circuit 90 like an NTSC signal.

[0032]By the switch 92the main screen signal from the multiplex circuit 90 and the vertical reinforcement signal from the fsc modulation circuit 91 are switched in a main screen period and a non-picture area periodand are outputted from the output terminal 103 as a second generation EDTV signal.

[0033]When the conventional television set corresponding to the present method is used as a receiving side device which receives this second generation EDTV signalas mentioned aboveit has a non-picture area up and downthe display of the letter box form that a main screen is displayed on middle of the screen will be performedand compatibility will be secured. In the conventional television set

corresponding to a second generation EDTV methodthe display of high resolution is performed by [which are level and uses a vertical reinforcement signal] having carried out multiplex.

[0034]Drawing 26 is a block diagram showing the conventional television set corresponding to such a second generation EDTV methodand shows the example indicated to Institute of Television Engineers of Japan technical report Vol.17No.65pp19-24and BCS'93-42 (Dec.1993). The decoder of drawing 26 decodes the second generation EDTV signal acquired by the encoder shown in drawing 25.

[0035]A second generation EDTV signal is supplied to the switch 112 via the input terminal 111. By the switch 112the main screen signal of a main screen period is given to the three-dimensional Y/C/HH' separation circuits 113 and the motion detection circuit 114and the vertical reinforcement signal of an up-and-down non-picture area period is given to the fsc demodulator circuit 115. The motion detection circuit 114 detects a motion of a main screen signaland outputs a motion detection signal. The three-dimensional Y/C/HH' separation circuits 113 have a frame memory which is not illustratedand separate a Y signal and a chrominance signal (IQ signal) from a main screen signal based on a motion detection signaland they separate a level reinforcement signal (HH' signal).

[0036]The separated Y signal is given to the adding machine 116 as a level low-pass luminance signal. HH' signal is given to the HH demodulator circuit 117it restores to itand HH signal which is a 4.2 thru/or 6-MHz level high-frequency component is given to the adding machine 116. By adding HH signal to a Y signalthe adding machine 116 raises the horizontal resolution of a main screen signaland is outputted to the adding machine 118the highpass filter (HPF) 119LPF120and the motion detection circuit 121.

[0037]On the other handit gets over by the fsc demodulator circuit 115and the vertical reinforcement signal from the switch 112 is supplied to the level extension circuit 122. 3 timestime extension is carried out by the level extension circuitand a vertical reinforcement signal is given to the LD/VH' separation demodulator circuit 123. The motion detection circuit 121 detects a motion of a main screen signaland is outputting the motion detection signaland the LD/VH' separation demodulator circuit 123 divides a vertical reinforcement signal into LD signal and VH' signal based on a motion detection signal. LD signal is given to SSKFVHPF124 and VH' signal is given to the 3->4 conversion circuit 125.

[0038]The vertical definition of a main screen signal is improved using LD and VH' signal to which it restored. SSKFVHPF124 outputs the vertical time high-frequency component of a luminance signal to the adding machine 118 by inverse filter processing. The adding machine 118 adds a vertical time high-frequency component to the main screen signal from the adding machine 116and amends the resolution lowering at the time of interlaced-scanning conversion. The output of the adding machine 118 is given to the 3->4 conversion circuit 130.

[0039]By the waysince it becomes irregular using the chrominance subcarrier in the transmitting sideLD signal does not contain a not less than 1.2-MHz ingredient.

Thereforeabout the not less than 1.2-MHz ingredient of a main screen signalthe resolution improvement which used the vertical reinforcement signal cannot be madebut motion adaptation scanning line interpolation is performed.
[0040]That isthe main screen signal from the adding machine 116 is band-limited to a not less than 1.2-MHz ingredient in HPF119movesand is supplied to the adaptation scanning line interpolation circuit 126. The motion adaptation scanning line interpolation circuit 126 performs scanning line interpolation based on a motion detection signaland outputs it to the adding machine 127. In actual hardwarefrom processing speed becoming high-speed if interlaced scanning is changed into sequential scanning by the motion adaptation scanning line interpolation circuit 126the transmitted scanning line and the scanning line generated by interpolation are divided into a direct system and an interpolation systemrespectivelyand is processed. That isthe output of the adding machine 116 is supplied to the adding machine 118 of a direct systemand the output generated by the interpolation from the motion adaptation scanning line interpolation circuit 126 is supplied to the adding machine 127 of an interpolation system.
[0041]On the other handthe ingredient of the zone of 1.2 MHz or less of levels of a main screen signal is taken out by LPF120and is given to SSKFVLP128. SSKFVLPF128 outputs the level low-pass vertical time low-pass ingredient of a main screen signal to the adding machine 129. By adding the output of SSKFVLPF128and the output of SSKFVHPF124the adding machine 129 improves the resolution of the level low-pass ingredient in an interpolation systemand outputs it to the adding machine 127. The adding machine 127 adds level low-pass and the level high-frequency component of an interpolation systemand outputs them to the 3->4 conversion circuit 130. The 3->4 conversion circuit 130 carries out scanning line conversion of the inputted main screen signal of a direct system and an interpolation system to the signal of 480lphand outputs it to the adding machine 132.
[0042]On the other handthe number of scanning lines is changed 4/3 time by the 3->4 conversion circuit 125and after the frequency shift of the VH' signal from the LD/VH' separation demodulator circuit 123 is carried out to the original vertical high region by the V shifter 131it is supplied to the adding machine 132. From adding the vertical high-frequency component of 360 thru/or 480lph to the vertical low-pass ingredient of 0 thru/or 360lph from the 3->4 conversion circuit 130the adding machine 132 amends resolution lowering at the time of scanning line conversion. The sequential scanning signal of 480lph from the adding machine 132 is given to the matrix circuit 133.
[0043]On the other handthe chrominance signal separated by the three-dimensional Y/C/HH' separation circuits 113 is given IC demodulator circuit 134and is returned to an I signal and a Q signal. An I signal and a Q signal are supplied to the 3->4 conversion circuit 137 and 138respectivelyafter a level zone is restricted by LPF135 and 136. The 3->4 conversion circuit 137 and 138 carry out scanning line conversion of an I signal and the Q signalrespectivelychange them into 480 sequential scanning signalsand are outputted to the matrix circuit

133. The matrix circuit 133 generates and outputs RGand B signal by matrix processing. The wide image in which it was level and vertical definition has been improved can be made to project by supplying the display which does not illustrate this RGand B signal.

[0044]By the waythe object for present NTSC broadcast mentioned abovethe object for teletextand the conventional television set for EDTV broadcast are analog composition. On the other handdigital broadcasting which digitizes and transmits a broadcasting signal is considered in recent years. Drawing 27 is a block diagram showing the transmission and reception system of the digitized television broadcasting. Drawing 27 is extracted from the system indicated to Institute of Television Engineers of Japan technical report Vol15No.35pp31-36and BCS'91-38 (Dec.1991). The system of drawing 27 shows ISDB (Integrated Service Digital Broadcasting) using 12 GHz-band satellite broadcasting waves.

[0045]The TV encoder 141 and 142 generate the digital signal of television picture TV1 and TV2respectively. The Still Picture Sub-Division encoder 143 generates the digital signal of a still pictureand the fax encoder 144 generates the digital signal of a facsimile image. These encoder 141 thru/or 144and digital signals from other encoders that are not illustrated are given to the packet encoder 145 thru/or 148and other packet encoders that are not illustratedrespectively. The packet encoder 145 thru/or 148and the packet encoder that is not illustrated packet-ize the inputted digital signaland outputs a digital bit stream to the multiplexer 149.

[0046]Multiplex [of each bit stream] is carried outa series of digital data are supplied to the digital modulation machine 150 by the multiplexer 149and it is modulated. Upconverting of the modulated digital signal is carried out by the up converter 151and it is transmitted from the antenna 152 as a signal of 14 GHz bands. In the receiver end transmitted to back each home which this transmission wave was received by the satellite 153 and changed into the signal of 12 GHz bandsIt is received via the antenna 154and frequency conversion of the broadcast wave from the satellite 153 is carried out to the signal of 1 GHz band by BS converter 155and it is supplied to BS tuner 157 which constitutes the ISDB tuner 156. BS tuner 157 carries out frequency conversion of the inputted signal furtherand gives it to the digital demodulation machine 158. It gets over with the digital demodulation machine 158and the demultiplexer 159 separates into each data streamand the output signal of BS tuner 157 is supplied to the packet decoder 160 thru/or 163and other packet decoders.

[0047]The packet decoder 160 thru/or 163and other packet decoders return the packet-ized data to the usual bit streamand supply it to the display device 164 thru/or 166the facsimile machine 167and other devices that are not illustratedrespectively. In this waytelevision picture TV1TV2and a still picture are displayed on the display device 164 thru/or 166respectivelyand a facsimile image is obtained from the facsimile machine 167.

[0048]Thusin an ISDB systemtwo or more television pictures can be changed into digital dataand Time Division Multiplexing can be carried outand they can be

transmittedand transmission of other digital data is also possible. For exampledigital datasuch as facsimile information and game softwareetc. can be transmitted simultaneously.

[0049]By the waythe system is built using the layer system as ISDB is explained in full detail in 1993 in the Institute of Television Engineers of Japan annual meetingITE'93the hierarchization model of ISDBof 15-6and "advanced features of digital television services" of 15-8.

[0050]Drawing 28 is an explanatory view showing the layer system indicated in these document.

[0051]Each class shows the typical function of ISDBthe left column of a figure is an example of the transmitting sideand the right column of a figure is an example of a receiver. The center row of the figure shows the example of the interface signal which connects the function of a layer and a layer. At the 1st and the lower layer of 2 or 3 layersthe processing capability relevant to even an addressee transmitting information is specifiedand the 5th and the upper layer of 6 or 7 layers prescribe the processing capability relevant to service. The function in which processing with the upper layer and a lower layer is adjusted is prescribed by the 4th layer.

[0052]In the transmitting sideit is the 7th layer and an imagea soundalphabetic dataetc. are specified. The 6th layer prescribes coding and the 5th layer prescribes the grouping of data. The speed of a bit stream is changed in the 4th layerand the 3rd layer prescribes packet-izing and Time Division Multiplexing. The 2nd layer prescribes error correcting code-ization and the 1st layer prescribes digital modulation.

[0053]For exampleas shown in the center row of a figurecoding processing based on the 6th layer in the program signal specified by the 7th layer is performed. Grouping of the coding data is carried out based on the 5th layerand speed change is carried out by the 4th layerand it is changed into the data of each channel. Nextit is packet-ized based on the 3rd layerand is error-correcting-code-ized by the 2nd layer. The error-correcting-code-ized bit stream is modulated based on the 1st layerand a transmission signal is transmitted via a transmission line.

[0054]On the other handeach class of a receiver is the inverse processing of each class of the transmitting siderespectively. In a receiverprocessing is performed from the 1st layer to the 7th layerand a program signal is reproduced.

[0055]Drawing 29 and drawing 30 are the block diagrams showing the decoder and encoder of ISDB based on the layer system of drawing 28respectively.

[0056]In drawing 30the picture A of television broadcasting A and the digital signal of the sound A are inputted into the input terminal 171 and 172respectively. The picture B of television broadcasting B and the digital signal of the sound B are inputted into the input terminal 173 and 174respectively. Digital datasuch as predetermined alphabetic dataare inputted into the input terminal 175.

[0057]The digital data of the picture A and the sound A is given and compressed into MPEG video encoder 176 and MPEG audio encoder 177respectivelyand is supplied to the packet encoder 178. The packet encoder 178 packet-izes

compressed data of a pictureand audio compressed dataand outputs them to the FIFO (first-in first-out) memory 179.
[0058]Similarlythe digital data of the picture B and the sound B is given and compressed into MPEG video encoder 181 and MPEG audio encoder 182respectivelyand is supplied to the packet encoder 183. The packet encoder 183 packet-izes compressed data of a pictureand audio compressed dataand outputs them to FIFO memory 184. The digital data from the input terminal 175 is changed into a predetermined digital bit stream by the converter 185by the packet encoder 186is packet-ized and is supplied to FIFO memory 187.
[0059]Time Division Multiplexing of FIFO memory 179184and the bit stream read from 187 is carried out by the multiplexer (henceforth MUX) 180. A correction code is added by the error correction circuit 188and the digital stream from MUX180 is given to the back up converter 190 by which digital modulation was carried out in the QPSK modulation circuit 189. The up converter 190 carries out frequency conversion of the digital modulation dataand outputs it from the output terminal 191.
[0060]On the other handin the receiver shown in drawing 29a transmission signal is given to the down converter 196 via the input terminal 195. Frequency conversion of the transmission signal is carried out with the down converter 196and it gets over to the original data by the QPSK demodulation circuit 197. Demodulated data is given to the back demultiplexer (henceforth DEMUX) 199 by which the error correction was carried out in the error correction circuit 198.
[0061]The demultiplexer 199 divides into each packet streams the digital stream which was controlled by the depacketizing control circuit 204 and inputted into it. The packet streams based on the picture A are given to MPEG video decoder 205 via FIFO memory 200and are supplied to the decrypted back synthetic circuit 208. The packet streams based on the picture B are given to MPEG video decoder 206 via FIFO memory 201and are supplied to the decrypted back synthetic circuit 208. The packet streams based on the sounds A and B are supplied to MPEG audio decoders 207 via FIFO memory 202. MPEG audio decoders 207 decrypt the inputted dataand output it as voice response from the output terminal 209.
[0062]The packet streams based on digital data are inputted into FIFO memory 203 from DEMUX199. These packet streams are supplied to the bus 211 via the interface (henceforth I/F) 210. CPU212 stores in the memory 213 the data inputted via I/F210 via the bus 211and it reads and it decodes. CPU212 outputs a decoded result to VRAM215 via the graphic controller 214. VRAM215 develops a decoded result in a picture and outputs image data to the synthetic circuit 208 via the graphic controller 24.
[0063]The synthetic circuit 208 compounds the image data of the pictures A and Band compounds the image data from VRAM215 and outputs it from the output terminal 216 as a generating picture. By supplying the display device which does not illustrate this generating picturethe pictures A and B and the picture based on digital data can be simultaneously displayed on a screen.
[0064]Image display is controllable by a remote control. The signal from the

remote control which is not illustrated is decoded by the control microcomputer 217and is supplied to the depacketizing control circuit 204. Depacketizing can be controlled by remote control operationfor examplethe sound B can be chosen as voice response. Only one side of the pictures A and B can also be displayed. The decoded result of the control microcomputer 217 is supplied also to CPU212 via I/F218. CPU212 controls image generation based on a decoded result. For exampleit is also possible to specify the display position of the picture based on the image data from VRAM215etc. by remote control operation. Thusimage datavoice dataand other digital data can be systematically processed with the device of drawing 29 and drawing 30.

[0065]Although digital broadcasting mentioned above performs the data communications of an one wayin digital CATV in recent yearsoffer of much more advanced service is considered by bidirectional data communications. Such a digital CATV system is explained by 89 ** 1 JI in full detail from 82 ** 1 JI on the Nikkei electronics and May 231994.

[0066]According to this documentwith a two way CATV systema digital bidirectional channel is established out of the existing analog channel. Drawing 31 is an explanatory view showing the spectrum of the transmission signal adopted as the CATV system which made such two-way communication possible.

[0067]As shown in drawing 31existing gets downan analog channel is assigned to 450 MHz from 50 MHzand transmission of about 50 channels is enabled. The conventional channel for extension is assigned to 500 MHz from 450 MHz. And the digital bidirectional channel is assigned to a not less than 500-MHz zone. That isthe control channel from which it gets downthe digital transmission channel from which it gets downand an uphill digital transmission channel are set as a zone (500 MHz thru/or 1 GHz)and the zone further for personal handy phones is also set as it.

[0068]The control channel from which it gets down is 1.5 MHz in bandwidthand transmits a QPSK modulation wave. The channel number of the digital transmission channel from which it gets down is about a maximum of 15bandwidth is 12 MHzand a modulation method adopts a 64 value QAM method. These going-down channels are assigned to 708 MHz from 500 MHz. An uphill digital transmission channel is assigned to 972 MHz from 900 MHzand about 45 channels are provided at the maximum. The bandwidth of each uphill channel is 1.5 MHzand transmits a QPSK modulation wave.

[0069]Drawing 32 and drawing 33 are the block diagrams showing the decoder and encoder of such a digital CATV systemrespectively.

[0070]In drawing 33the signal of the analog transmission channel transmitted with the analog transmission channel of about 50 is given to a band-pass filter (henceforth BPF) via the input terminal 221and is restricted to a 50 thru/or 450-MHz zone. The electrical and electric equipment and the light conversion circuit 223 are outputted to the optical fiber which changes the signal of this analog transmission channel into a lightwave signaland does not illustrate it.

[0071]In order to realize a video on demand corresponding in real time to the

demand of the video software from the user to the center of a CATV systemthe video server 224 is formed. The video server 224 is connected to the ATM (Asynchronous Transfer Mode) switch 225 via two or more transmission lines. ATM switch 225 is connected to the digital transmission channel transmission part 226 from which it gets downgoing upand control channel strange and the demodulation section 227 from which it gets downand the uphill digital transmission channel receive section 228.

[0072]The video server 224 stores two or more video softwareand outputs the image data according to the demand from a user. This image data is supplied to the 15 64 value QAM modulation parts 229 by the maximum of the transmission section 226 via ATM switch 225in order to transmit by the digital transmission channel from which it gets down. It is determined whether a 64 value each QAM modulation part supplies data to which 64 value QAM modulation part with ATM switch 225 by corresponding to each transmission channeli.e.does it transmit by which channel among the digital transmission channels of 15 channels from which it gets down?. The 64 value QAM modulation part 229 is given to BPF230 as a signal which becomes irregular and transmits the inputted image data by the digital transmission channel from which it gets down. The signal of the digital transmission channel from which it gets down is sent out via the optical fiber which is not illustratedafter it is band-limited to 500 thru/or 708 MHz by BPF230 and being changed into a lightwave signal by the electrical and electric equipment and the light conversion circuit 231.

[0073]Going upcontrol channel strange and the demodulation section 227 from which it gets downand the uphill digital transmission channel receive section 228 have the multiplexing device 232and the multiplexing device 232 is connected to ATM switch 225. The multiplexing device 232 multiplexes and transmits the data transmitted by 1.5M bit per second to 45M bit per secondand it changes into 1.5M bit per second data the data transmitted by 45M bit per second. CDC transmitted by the control channel which gets down from the control circuit which is not illustrated is also supplied to ATM switch 225and this CDC is given to the multiplexing device 232 by ATM switch 225. QPSK modulation of CDC is given and carried out to the QPSK modulation part 233 from the multiplexing device 232and it is supplied to BPF230 with the signal of the digital transmission channel from which the transmission section 226 is supplied and it gets down.

[0074]The signal transmitted via the optical fiber on the other hand from the terminal which is not illustrated is inputted into light and the electrical conversion circuit 235is changed into an electrical signaland is supplied to the uphill digital transmission channel receive section 228. BPF236 of the receive section 228 band-limits the signal of the inputted going-up channel to 900 thru/or 972 MHzand supplies it to about 45 QPSK demodulation parts 237 at the maximum. After getting over in QPSK demodulation part 237uphill data is multiplexed in the multiplexing device 232and is supplied to a control circuit etc. via ATM switch 225. CDC of going up transmitted by the uphill digital transmission channel is given to QPSK demodulation part 234 of strange and the demodulation section 227and

recovers from BPF236. CDC to which it restored is also multiplexed with the multiplexing device 232and is supplied to ATM switch 225.
[0075]The decoder by the side of a terminal is constituted by the analog decode part 242the modem section 243the graphics part 244and the picture decode part 245 as shown in drawing 32. The optical fiber which is a transmission line and which is not illustrated is connected to the terminal 241. The signal which has a spectrum shown in drawing 31 via the terminal 241 is inputted. This input signal is supplied to the display device which is not illustratedand it is supplied also to the analog decode part 242.
[0076]The analog decode part 242 decodes the present analog NTSC signaland the analog signal from the terminal 241 is supplied to the analog tuner 246. The analog tuner 246 is controlled by the analog channel channel selection circuit 247tunes in the signal of a predetermined channeland changes the modulating signal of an analog into the video signal of baseband. Scramble is given to the video signal at the broadcasting station sideand the releasing scramble circuit 248 cancels the scramble of a video signaland outputs it to the equalization circuits 249such as volume. Volume etc. are adjusted by the equalization circuits 249such as volumeand a video signal is outputted to the mixing circuit 250 of video and an audio signal. In the mixing circuit 250decoding of an NTSC signal is not performed but it decodes by the NTSC decoder of the display device which is not illustrated.
[0077]On the other handthe signal of the digital transmission channel from which it gets down is supplied to the modem section 243. The modem section 243 gets down and performs the recovery of dataand the abnormal conditions of uphill datait gets downdata is supplied to 64 value QAM demodulation part 251and CDC is supplied to QPSK demodulation part 252. It gets downand it gets over by 64 value QAM demodulation part 251and data is given to the frame disassembling circuit 254 of the picture decode part 245. It gets over by QPSK demodulation part 252and CDC is supplied to the VCI (Virtual Channel Identifier) extracting circuit 255 of the picture decode part 250 via the controller 253 for RF circuits.
[0078]The frame disassembling circuit 254 changes into a digital stream the going-down data to which it restoredand gives it to the VCI extracting circuit 255and the VCI extracting circuit 255 extracts only the image data of predetermined picture software based on CDC. This image data is decrypted by MPEG decoding circuit 256and is supplied to the mixing circuit 250 of video and an audio signal.
[0079]On the other handfrom the CPU mainboard 258 of the graphics part 244the graphical data for making predetermined graphics project is outputted on the display screen of a display device. This graphical data is changed into graphic-images data by the graphics board 259and is supplied to the mixing circuit 250 of video and an audio signal by it. It is also possible to print graphic images by giving the graphical data from the CPU mainboard 258 to the printer which is not illustratedfor example.
[0080]or [that the mixing circuit 250 of video and an audio signal compounds the image data and voice data from the analog decode part 242the modem section 243and the graphics part 244] -- or it switches and a video signal and an audio

signal are outputted. In this wayon the display screen of a display devicethe image based on an analog video signal is outputtedand the image of video software which the user demanded is projected. The predetermined graphic images by which it was generated at the terminal are also projected.

[0081]Uphill data is created by the control circuit which is not illustratedvia the control 253 for RF circuitsis supplied to the QPSK modulation part 257and is sent out to it via the back terminal 241 by which QPSK modulation was carried out.

[0082]Thusvarious broadcast services based on second generation EDTV broadcastdigital broadcastingand two-way communicationsuch as CATVare usually planned besides broadcast and teletext. Drawing 34 is a block diagram showing the conventional television set corresponding to all such broadcast services.

[0083]The ISDB broadcasting station 261 has an encoder of drawing 30 and an identical configurationand transmits a broadcast wave via the antenna 152. This transmission wave is transmitted to each home via the satellite 153. The ground broadcast stations 262 have an encoder of drawing 22 and an identical configurationand can send out an NTSC broadcast wave via the antenna 265. The data generating device 263 can output a teletext signal with the encoder of the same composition as drawing 24multiplex [of the teletext signal] can be carried out to an NTSC broadcast waveand the ground broadcast stations 262 can transmit itfor examplethe data generating device 263 generated. The bi-directional CATV station 264 has an encoder of drawing 33 and an identical configurationand can transmit the data which has a spectrum shown in drawing 31 via CATV cables 266.

[0084]The television set 267 is constituted by the ISDB decoder 268NTSC decoder 269the teletext decoder 270the CATV decoder 271and the screen control part 273. The ISDB decoder 268 is a decoder of drawing 29 and an identical configurationrestores to the received data from the antenna 154and outputs a generating picture to the screen control part 273. NTSC decoder 269 is a decoder of drawing 21 and an identical configurationrestores to the signal induced at the antenna 272and outputs the generating picture based on NTSC broadcast to the screen control part 273. The teletext decoder 270 is constituted like drawing 23and outputs the generating picture based on the teletext signal extracted from the NTSC broadcasting signal to the screen control part 273. The CATV decoder 271 is a decoder of drawing 32 and an identical configurationit gets downand restores to dataand outputs a generating picture to the screen control part 273.

[0085]or [the screen control part 273 being controlled based on user's operationand compounding the decoder 268 thru/or the generating picture from 271] -- or it switches and outputs. In this waydisplay screen 274 Upwardsthe display based on these generating pictures is performed. At drawing 34it is the display screen 274. It is shown that the picture 275 based on ISDB broadcastNTSC broadcastand CATV broadcast thru/or 277and the guide screen 278 are displayed above.

[0086]Thusin order to correspond to two or more broadcast servicesit needed to have two or more decoders corresponding to each broadcast serviceand there was

a problem that cost will become high. In ISDB broadcastmulti-angle broadcast on which two or more images are displayed simultaneously is due to be performed. In order to correspond to this broadcast serviceit will be necessary to have two or more decoders for imagesand will be a high cost. With the broadcasting format which transmits digital data directly like ISDBoffer of service using the software which transmitted the data of software with picture image dataand was transmitted in the receiver is considered. A user is able to extend a function by this according to hope. Howeverin this casein order to correspond to extension of servicethe decoding function had to be changedcost comparatively high at the time of service extension was neededand there was a problem of barring flexible extension.

[0087]

[Problem(s) to be Solved by the Invention]Thusin the conventional television set mentioned abovethe decoder corresponding to each needed to be prepared for various broadcast servicesand there was a problem of being a high cost. The decoding function needed to be changed with extension of service and there was also a problem that flexible extension was barred.

[0088]This invention was made in view of this problemand is ****. the purpose is alikeand modularizes each required functionand it is providing the television set which can respond to various broadcast services by low cost by connecting each functional module by a bus structure.

[0089]An object of this invention is to provide the television set which can respond to extension of service easily by modularizing each function required for decoding.

[0090][Elements of the Invention]

[Means for Solving the Problem]A television set concerning Claim 1 of this invention is characterized by comprising:

Two or more functional modules which realize two or more functions required for transmission and reception of two or more broadcast waves and a communication wave.

A receiving module in which the television set which possesses time sharing or a bus structure for using it independentlyand is applied to Claim 16 of this invention in said two or more functional modules can receive two or more broadcast waves and communication waves.

A recovery module which restores to an input signal from this receiving moduleand outputs demodulated data.

A conversion module which changes said demodulated data into a predetermined data rowand a decryption module which decrypts a data row from this conversion moduleAn image output module which projects a picture based on decoding data from this decryption moduleA voice response module which outputs a sound based on decoding data from this decryption moduleAn abnormal-conditions module which modulates predetermined send dataand a transmitting module which transmits an output of this abnormal-conditions module as said broadcast wave or

a communication waveA control means which changes the contents of processing of said receiving modulea recovery modulea conversion modulea decryption modulean image output modulea voice response modulean abnormal-conditions moduleand a transmitting module according to said two or more broadcast waves or a communication wave.

[0091]
[Function]In Claim 1 of this inventiontwo or more functions required for transmission and reception of two or more broadcast waves and a communication wave are realized by two or more functional modules. a bus structure -- each functional module -- time sharing -- or it is used independently and transmission and reception of two or more broadcast waves and a communication wave are performed. That isit is possible to use one functional module for transmission and reception of two or more broadcast waves and a communication wave.
[0092]In Claim 16 of this inventiona receiving module is ability ready for receiving about two or more broadcast waves and communication waves. It gets over with a recovery module and an input signal is changed into a predetermined data row by the conversion module. It is decrypted with a decryption module and image data and voice data are reproduced. Such image data and voice data are shown by an image output module and the voice response modulerespectively. It becomes irregular with an abnormal-conditions moduleand predetermined send data is transmitted with a transmitting module. And it is made to correspond to various broadcast services by changing the contents of processing of these modules according to two or more broadcast waves or communication waves.
[0093]
[Example]Hereafterworking example of this invention is described with reference to Drawings. Drawing 1 is a block diagram showing one working example of the television set concerning this invention. Out of the analog broadcasting of the present NTSC systemthis example makes digital broadcasting ability ready for receiving. As digital broadcastingterrestrial broadcastingsatellite broadcastingand cable broadcast shall be performed.
[0094]The digital signal and television signal which were induced at the antenna 318 for terrestrial broadcasting and the antenna 319 for satellite broadcasting are supplied to the mixing circuit (henceforth MIX) 320. MIX320 gives these signals to the television set 301.
[0095]The television set 301 The NTSC decoding module 303The digital-broadcasting receiving module 304 and the depacketizing module 305It has the bus 302 which connects the various modules of the digital cable module 306the MPEG video module 307the MPEG audio module 308etc.and these modules. The module 303 of this example thru/or 308 realize each function. The television set 301 DMA(Direct-Memory-Access device) 312It has CPU313the main memory 314VRAM310the backend processor 311the television picture tube 317the amplifier 315the loudspeaker 316the remote control controller 309etc.
[0096]The program for controlling the television set 301 is stored in the main

memory 314and CPU313 controls the whole system by performing processing based on this program. CPU313 can set up parameter data to each module 303 thru/or 308and it can change the set-up parameter data. DMA312 is controlled by CPU313controls the data transfer by the bus 302and enables transmission and reception of data between each module 303 thru/or 308etc.

[0097]The high frequency receive section which does not illustrate the NTSC decoding module 303It is constituted by treating partssuch as an image demodulation section and a chrominance-signal demodulation sectionand after decoding the television signal of the NTSC system inputted from MIX320 and changing into a digital signalit outputs via the bus 302. The digital-broadcasting receiving module 304 receives the digital signal inputted from MIX320and outputs the digital data of a predetermined channel via the bus 302. The data packet-ized via the bus 302 is inputtedand from depacketizing this datathe depacketizing module 305 is changed into a digital streamand is outputted to the bus 302. The video data coded with the MPEG system via the bus 302 is inputtedand the MPEG video module 307 is decryptedand outputs image data to the bus 302. The audio information coded with the MPEG system via the bus 302 is inputtedand the MPEG audio module 308 is decryptedand outputs voice data to the bus 302. The MPEG video module 307 and the MPE audio module 308 support MPEG1 method or the MPEG2 system.

[0098]It has a tuner for CATVa digital CATV signal is inputted via the cable which is not illustratedand the digital cable module 306 tunes in a predetermined channeland outputs packet data to the bus 302.

[0099]In this examplethese modules 303 thru/or 308 are functional modules. That isit is not for these modules 303 thru/or 308 realizing a predetermined functionrespectivelyand each module does not necessarily support predetermined broadcast service alone. It is connected by bus 302transmission and reception of data are controlled by DMA312and each module 303 thru/or 308 are shared to two or more broadcast services. Each module 303 thru/or 308 can also be used by time sharing by control of DMA312and can also be used independently. It is possible by changing these modules 303 thru/or the parameter of 308 to also make each module correspond to two or more broadcast services. Television set 301 since each module 303 thru/or 308 are modularized It is also easy to constitute from a main partenabling free attachment and detachment.

[0100]Image data gives and holds VRAM310 via the bus 302. The backend processor 311 performs predetermined processing to the image data which read the image data of VRAM310 and was read based on the control data inputted via the bus 302and stores it in VRAM310and it is supplied to the television picture tube 317. The television picture tube 317 projects the picture based on the image data from the backend processor 311 on a display screen. The amplifier 315 amplifies the voice data inputted via the bus 302and outputs it to the loudspeaker 316. The loudspeaker 316 carries out output power of sound of the supplied voice data. The remote control controller 309 outputs the data based on operation of the user to the remote control unit which is not illustrated to the bus 302.

[0101]Nextoperation of working example constituted in this way is explained.
[0102]Nowthe analog broadcasting of the present NTSC system shall be received. If remote control key operation for a user to receive analog broadcasting is performedthe remote control data based on this operation will be outputted to the bus 302 from the remote control controller 309. If remote control data are received via DMA312CPU313 will make it go via DMA312 and will transmit a parameter required for reception of analog broadcasting to the NTSC decoding module 303 via the bus 302.
[0103]On the other handthe television signal of the analog induced at the antenna 318 is inputted into the NTSC decoding module 303 via MIX320. the NTSC decoding module 303 -- remote control controller 309. from -- the receiving channel is specified.
A predetermined channel is tuned in and decoded from an NTSC signaland the video signal of baseband is obtained.
This video signal is outputted to the back bus 302 changed into digital image data and voice data by the NTSC decoding module 303. DMA312 transmits image data to VRAM310 and transmits voice data to the amplifier 315.
[0104]It is read by the backend processor 311predetermined processing is performedand picture image data is supplied to the television picture tube 317. After voice data is amplified with the amplifier 315it is supplied to the loudspeaker 316. In this waythe picture of NTSC broadcast is projected by the display screen of the television picture tube 317and the output power of sound is outputted from the loudspeaker 316.
[0105]Nextdigital broadcasting using a satellite shall be received. This digital broadcasting shall be coded with the MPEG system. If the remote control data based on a user's key operation are inputted into CPU313CPU313 makes it go via DMA312 and each parameter required for reception of digital broadcasting via the bus 302 The digital-broadcasting receiving module 304It transmits to the depacketizing module 305the MPEG video module 307and the MPEG audio module 308.
[0106]On the other handthe satellite broadcasting waves received by the antenna 319 are inputted into the digital-broadcasting receiving module 304 via MIX320. The digital-broadcasting receiving module 304 tunes in the channel based on a user's remote control operation from satellite broadcasting wavesand outputs a digital bit stream to the bus 302. This digital bit stream is transmitted to the depacketizing module 305 by DMA312. A digital bit stream is changed into the data row of an MPEG system by the depacketizing module 305and is outputted to the bus 302 with it. DMA312 transmits the data row of a video data to the MPEG video module 307 among the data rows of the MPE method outputted to the bus 302and transmits the data row of audio information to the MPEG audio module 308.
[0107]The MPEG video module 307 and the MPEG audio module 308 decrypt video and the MPEG data row of an audiorespectivelyand restore image data and voice data. DMA312 transmits the image data and voice data which were restored to VRAM310 and the amplifier 315 via the bus 302respectively. In this waythe picture

based on digital broadcasting is displayed on the display screen of the television picture tube 317and the output power of sound is outputted from the loudspeaker 316.

[0108]Nextdigital CATV broadcast shall be received. If remote control key operation for a user to choose a predetermined CATV channel is performedthe remote control data based on this operation will be inputted into CPU313. CPU313 makes it go via DMA312 and each parameter required for reception of digital CATV via the bus 302 The digital cable module 306It transmits to the depacketizing module 305the MPEG video module 307and the MPEG audio module 308.

[0109]The digital CATV signal from the CATV cables which are not illustrated is supplied to the digital cable module 306and the channel based on a user's remote control operation tunes it in in the digital cable module 306. The digital bit stream from the digital cable module 306 is transmitted to the depacketizing module 305 by DMA312. The depacketizing module 305 changes the digital bit stream of a cable system into the data row of an MPEG systemand outputs it to the bus 302. DMA312 supplies a video data to the MPE video module 307 among the data rows of this MPEG systemand supplies audio information to the MPEG audio module 308.

[0110]The MPEG video module 307 and the MPEG audio module 308 decrypt video and the MPEG data row of an audiorespectivelyand restore image data and voice data. DMA312 transmits the image data and voice data which were restored to VRAM310 and the amplifier 315 via the bus 302respectively. In this waythe picture based on digital CATV broadcast is displayed on the display screen of the television picture tube 317and the output power of sound is outputted from the loudspeaker 316.

[0111]Thusalso in any in the case of receiving digital CATV broadcast in this examplewhen receiving digital broadcastingIt depacketizes with the depacketizing module 306the MPEG video module 307 and the MPEG audio module 308 perform MPEG decoding processingand common use of the hardware is carried out.

[0112]In this examplenamelythe NTSC decoding module 303The digital-broadcasting receiving module 304 and the depacketizing module 305It has a functional module of the digital cable module 306the MPEG video module 307the MPEG audio module 308etc.and the data transfer is made possible between each functional module via the bus 302 by DMA312. By such modularization and a bus structure of each functioncommon use of each functional module can be carried out to two or more broadcast services. Thuswithout providing the decoder corresponding to each in each broadcast serviceEven when common use of the functional module is carried outtwo or more broadcast services are supported and it corresponds to various broadcast servicesthe increase in the scale of hardware can be controlledand as compared with the formerthe scale of hardware can be reduced remarkably.

[0113]Since it has modularizedchange of a function is easy by change of a module. Extension is very easy byhaving composition which connects a module to the

Television Sub-Division receiver body with a common terminal for exampleand providing this terminal too much. For exampleit is easy to also make it correspond to multichannel-ization which displays simultaneously two or more pictures based on different broadcast service on a screen by addition of a module.
[0114]Drawing 2 is a block diagram showing other working example of this inventionand corresponds to multichannel-ization. In drawing 2identical codes are given to the same component as drawing 1and explanation is omitted.
[0115]As for the television set 321 of this examplethe extended MPEG video module 322the extended MPEG audio module 323and the synchronous phase control processing part 324 are added to the television set 301 of drawing 1.
[0116]The extended MPEG video module 322 and the extended MPEG audio module 323It is the MPEG video module 307 and the MPEG audio module 308and an identical configurationrespectivelyand the video data or audio information coded with the MPEG system via the bus 302 is inputtedit decryptsand image data or voice data is outputted to the bus 302. The synchronous phase control processing part 324 is asynchronousand can perform read/write to VRAM310and the image data stored in VRAM310 is readThe multi screen which comprises the screen of two or more channels by PIP (Picture In Picture) processing is compounded.
[0117]Nextoperation of working example constituted in this way is explained.
[0118]Based on a user's remote control operationthe picture based on digital broadcasting and digital CATV broadcast shall be simultaneously displayed on the display screen of the television picture tube 317. The remote control data from the remote control controller 309 are supplied to CPU313 via the bus 302. CPU313 reads the information stored in the main memory 314 based on remote control dataand transmits various parameters to each module 304 thru/or 308322and 323. As a parameterthere is data of the window size for displaying the data length and each channel of a packetfor exampleetc. After CPU313 transmits these parameter data to each moduleit initializes the function of each module and makes processing start.
[0119]The digital broadcast wave induced at the antenna 319 is inputted into the digital-broadcasting receiving module 304 via MIX320. The digital-broadcasting receiving module 304 chooses the channel specified by a userand outputs the digital bit stream to the bus 302. On the other handthe digital CATV signal from the cable which is not illustrated is supplied to the digital cable module 306and the channel based on remote control operation tunes it in. The digital bit stream from the digital cable module 306 is also outputted to the bus 302. DMA312 transmits the digital bit stream from the digital-broadcasting receiving module 304and the digital bit stream from the digital cable module 306 to the depacketizing module 305 via the bus 302 at time sharing.
[0120]The depacketizing module 305 changes the broadcast system digital bit stream from the digital-broadcasting receiving module 304 into an MPEG data rowand. The cable system digital bit stream from the digital cable module 306 is changed into an MPEG data row. In this casethe depacketizing module 305 depacketizes by time sharing to each inputchanging the parameter to the

broadcast system digital bit stream and cable system digital bit stream which are inputted.

[0121]A video data is transmitted to the MPEG video module 307 by DMA312 among the broadcast system MPEG data rows from the depacketizing module 305and audio information is transmitted to the MPEG audio module 308. DMA312 transmits a video data to the extended MPEG video module 322 among cable system MPEG data rowsand transmits audio information to the extended MPEG audio module 323.

[0122]The MPEG video module 307 and the MPEG audio module 308 decrypt the video data and audio information of a broadcast system which were coded with the MPEG systemrespectivelyand restore image data and voice data. On the other handthe extended MPEG video module 322 and the extended MPEG audio module 323 decrypt the video data and audio information of a cable system which were coded with the MPEG systemrespectivelyand restore image data and voice data. The image data restored with the MPEG video module 307 and the extended MPEG video module 322 is transmitted and stored in VRAM310 by DMA312.

[0123]It is asynchronously read by the synchronous phase control processing part 324PIP processing is carried outand the image data of a broadcast system and the image data of a cable system which were stored in VRAM310 are compoundedand are stored in VRAM310. After the backend processor 311 reads the image data of the multi screen stored in VRAM310 and performs predetermined processingit is supplied to the television picture tube 317. In this wayon the display screen of the television picture tube 317two screens based on digital broadcasting and digital CATV broadcast are displayed by PIP display.

[0124]On the other handafter the voice data of the broadcast system from the MPEG audio module 308 and the extended MPEG audio module 323 and a cable system is transmitted to the amplifier 315 by DMA312 and is amplifiedit is changed into an analog signal and output power of sound is carried out from the loudspeaker 316. It is also possible to output simultaneously the output power of sound of a broadcast system and a cable system in a stereoand it is also possible to choose and output only either.

[0125]Thusaccording to this examplethe parameter of the depacketizing module 305 is changed into time sharingDepacketizing for reception of digital broadcasting and digital CATV broadcast is performedEven when displaying the multi screen based on digital broadcasting and digital CATV broadcastit can decode only with the module 305 for depacketizingand increase of a hardware scale can be controlled. The processing speed of the present MPEG chip is taken into consideration for decoding of an MPEG data rowAlthough the extended MPEG video module 322 and the extended MPEG audio module 323 are used out of the MPEG video module 307 and the MPEG audio module 308It is possible enough like a depacketizing module to attain sharing by the time division processing of the MPEG video module 307 and the MPEG audio module 308without needing an extension module in the futureif the processing speed of an MPEG chip improves.

[0126]Drawing 3 is a block diagram showing other working example of this

invention. In drawing 3identical codes are given to the same component as drawing 1and explanation is omitted. This example adds the two-way communication function of digital CATV. A two-way communication function is required for VOD (Video On Demand) of digital CATV.

[0127]Replace this example with the digital cable module 306and the two-way communication module 332 is adoptedand the point which adopted the graphics controller 333 differs from drawing 1. The digital data of digital bi-directional CATV broadcast is inputted from the cable which is not illustratedand the two-way communication module 332 restores to this digital dataand outputs packet data to the bus 302. The two-way communication module 332 has a controller for RF circuitsand a QPSK modulation partfor exampleand can also send out uphill data now via the cable which is not modulated and illustrated. The graphics controller 333 changes into the graphics data of GUI (Grahphics User Interface) the data inputted via the bus 302and outputs it.

[0128]Nextoperation of working example constituted in this way is explained.

[0129]Remote control operation for viewing and listening to digital CATV broadcast shall be performed by the user. The spectrum of a digital CATV broadcast signal shall be shown in drawing 31. The remote control data from the remote control controller 309 are supplied to CPU313and CPU313 reads the data of the main memory 314and by DMA312. The parameter according to a CATV broadcast receiving function is made to transmit to each module 305307308332the graphics controller 333and the backend processor 311. Parameter data is set in registers of the inside which is not illustratedsuch as each moduleand the function of each module is changed into CATV reception.

[0130]The graphics controller 333 transmits the graphics data of GUI which shows selectiona program contentetc. of a channel to VRAM310. The graphics data stored in VRAM310 is read by the backend processor 311and is supplied and displayed on the television picture tube 317. A user performs selection operation of a programetc. with a remote control unitfor examplelooking at this display.

[0131]If the remote control data based on a user's selection operation are transmitted to CPU313 from the remote control controller 309CPU313 will transmit the parameter data corresponding to the transmitted data to the two-way communication module 332. The two-way communication module 332 creates the data for the communication based on remote control datafor examplecarries out QPSK modulationand is sent out to a cable.

[0132]The data from the television set 331 is transmitted to the CATV base station which is not illustrated via a cable. A base station starts supply of the digital data of the program based on the data in which selection of a program is shown.

[0133]The two-way communication module 332 starts reception of digital dataand it transmits the command which shows that reception of the program was started to CPU313. TherebyCPU313 publishes the command for stopping the output of graphics data to the graphics controller 333and stops the display based on the graphics data of GUI.

[0134]The two-way communication module 332 restores to received dataand outputs a digital bit stream to the bus 302. This digital bit stream is transmitted to the depacketizing module 305 by DMA312and is changed into an MPEG data row. The video data of the MPEG data rows from the depacketizing module 305 is supplied to the MPEG video module 307 by DMA312 via the bus 302and audio information is supplied to the MPEG audio module 308. With the MPEG video module 307 and the MPEG audio module 308the video data and audio information which were coded with the MPEG system are decryptedand image data and voice data are restored.

[0135]The image data and voice data which were restored are transmitted to VRAM310 or the amplifier 315 by DMA312respectively. Image data is supplied to the television picture tube 317after being read into the backend processor 311 from VRAM310 and performing predetermined processing. On the other handvoice data is given to the back loudspeaker 316 supplied and amplified by the amplifier 315. In this waythe picture and sound based on CATV broadcast are shown from the television picture tube 317 and the loudspeaker 316respectively.

[0136]Thusin this exampletwo-way communication becomes possible by changing into a two-way communication module the digital cable module connected to the bus 302. Even when new broadcast service is startedsharing of hardware is possible and it can control that a hardware scale increases as well as working example of drawing 1.

[0137]Drawing 4 is a block diagram showing other working example of this invention. The television set 341 of this example subdivides furthercarries out grouping of the function of each module in drawing 1 thru/or drawing 3 collectively for every functional module of an identical kindconnects the group of each functional module by busand is constituted.

[0138]The present NTSC signala digital broadcast signalor a CATV signal gets down to the input terminal 342 thru/or 344respectivelyand a signal is inputted. With the channel selection control signal outputted from the bus controller 348 mentioned latera channel selection is controlledand the NTSC tuner 345 tunes in the signal of a predetermined channeland obtains the video signal of baseband. With the channel selection control signal outputted from the bus controller 348a channel selection is controlledand the ISDB tuner 346 tunes in the signal of a predetermined channeland obtains the digital data of a broadcast system. With the channel selection control signal outputted from the bus controller 348a channel selection is controlledand CATV tuner 347 tunes in the signal of a predetermined channeland obtains the digital data of a cable system. The CATV modulator 350 modulates uphill data and outputs it from the output terminal 351.

[0139]The broadcast system digital data from the analog video signal from the tuner 345 and the ISDB tuner 346 and the cable system digital data from CATV347 are outputted to the analog switch box 349. The analog switch box 349 is controlled by the bus controller 348and switches an input and output pointThe tuner 345 thru/or the output of 347 are outputted to a strange recovery module group's QPSK demodulation part 35164QAM demodulation section 352 or A/D

conversionand clock reproduction part 354and the output of the QPSK modulation part 353 is outputted to the CATV modulator 350. The demodulation section 351352the modulation part 353the A/D conversionand the clock reproduction part 354 are connected to the bus 356 for control and data via I/F. The demodulation section 351352the modulation part 353an A/D conversionand the clock reproduction part 354 are controlled by the control signal outputted from the bus 356.

[0140]Drawing 5 is a block diagram showing the concrete composition of the QPSK modulation part 353 in drawing 4.

[0141]The digital data from the bus 356 is supplied to the in-series parallel conversion circuit 376 via I/F375. The in-series parallel conversion circuit 376 outputs the inputted serial data to the multiplier 377 and 378 by turns. The career which has orthogonality relation via the phase converter 379 mentioned later is inputtedrespectivelyand the multiplier 377 and 378 become irregular by the multiplication of the data from the in-series parallel conversion circuit 376and each career. The career generation circuit 380 outputs the oscillation output of predetermined frequency to the phase converter 379. By carrying out the phase shift of the oscillation outputthe phase converter 379 generates the career of ** which has orthogonality relation. The multiplier 377 and the output of 378 are supplied to the adding machine 381and the adding machine 381 compounds the multiplier 377 and the data from 378and outputs them to the analog switch box 349.

[0142]In the QPSK modulation part constituted in this waythe serial data from I/F375 are supplied by turns to the multiplier 377 and 378 by the in-series parallel conversion circuit 376. On the other handthe phase shift of the career of the predetermined frequency from the career generation circuit 380 is carried out by the phase converter 379and the career which has orthogonality relation mutually is supplied to the multiplier 377 and 378.

[0143]The multiplier 377 performs the multiplication of the inputted data and the career whose phase is 45 degrees. The multiplier 378 performs the multiplication of the inputted data and the career whose phase is 45+90 degrees. Drawing 6 shows the phase of the multiplier 377 and the signal outputted from 378. When the digital data inputted into the multiplier 377 is "1"the signal 1 of drawing 6 is outputted from the multiplier 377and when it is "0"the signal 2 of drawing 6 is outputted from the multiplier 377. When the digital data inputted into the multiplier 378 is "1"the signal 3 of drawing 6 is outputted from the multiplier 378and the signal 4 is outputted when it is "0." The adding machine 381 compounds the multiplier 377 and the output of 378and outputs them to the analog switch box 379.

[0144]Drawing 7 is a block diagram showing the concrete composition of QPSK demodulation part 351 in drawing 4.

[0145]The digital data from the analog switch box 349 is supplied to the two distributors 361. The two distributors 361 distribute the inputted digital dataand output it to the multiplier 362 and 363. Oscillation output frequency is controlled by the control signal from the carrier reproduction circuit 366 mentioned laterand

the voltage controlled oscillator (henceforth VCO) 365 outputs an oscillation output (reproduced carrier) to the phase converter 364 with it. When the phase converter 364 carries out the phase shift of the oscillation outputa phase outputs the reproduced carrier which is 45 degreesand the reproduced carrier of 45+90 phases to the multiplier 362 and 363respectively.

[0146]The multiplier 362 and 363 detect electricity by carrying out the multiplication of each reproduced carrier which has orthogonality relationand the digital data from the two distributors 361respectively. Each detection output from the multiplier 362 and 363 is given to LPF367 and 368respectively. LPF367 and 368 band-limit the inputted data and output it to the comparator 369 and 370. The comparator 369 and 370 acquire the binary-ized digital data sequence by comparing the inputted signal with a predetermined threshold. I/F371 carries out Time Division Multiplexing of the comparator 369 and the digital data sequence from 370and outputs them to the bus 356.

[0147]The carrier reproduction circuit 366 reproduces a career based on the output of LPF367 and 368outputs the control signal based on the frequency and the phase shift of a reproduced carrier to VCO365and obtains a carrier synchronization.

[0148]In the QPSK demodulation part constituted in this wayby the two distributors 361digital data is distributed two times and given to the multiplier 362 and 363. The reproduced carrier which has orthogonality relation mutually is supplied to the multiplier 362 and 363and the multiplier 362 and 363 restore to data by the multiplication of the data and the reproduced carrier which were inputted. For examplewhen the signal 1 of drawing 6 is inputted into the multiplier 362the multiplier 362 outputs "1" to the comparator 369and when the signal 2 is inputted0is outputted to the comparator 369. The multiplier 363 will output "0" to the comparator 370if the signal 3 of drawing 6 is inputted and "1" will be inputted into the signal 4. The comparator 369 and 370 binary-ize the inputted signaland output digital data. The comparator 369 and the digital data from 370 are outputted to the bus 356 via I/F371.

[0149]Drawing 8 is a block diagram showing the concrete composition of the 64QAM demodulation section 352 in drawing 4. In drawing 8identical codes are given to the same component as drawing 7and explanation is omitted. Drawing 9 is an explanatory view for explaining the symbol data of 64QAM.

[0150]The 64QAM demodulation section 352 of drawing 8 is replaced with the comparator 369 of QPSK demodulation part 351 of drawing 7and 370respectivelyand the octal -> binary conversion circuit 372 and 373 are provided. Octal -> the binary conversion circuit 372 and 373 change the digital data of an octal into the digital data of a binaryand output it to I/F371.

[0151]A recovery is performed in the 64QAM demodulation section constituted in this way by multiplication with the output of the multiplier 362and the reproduced carrier which has orthogonality relation mutually by 363 and the two distributors 361. Drawing 9 shows the vector of the symbol data of 64QAM. The symbol data of 64QAM modulates the career which has orthogonality relation on eight levels in

an amplitude directionand is formed. Thereforeas shown in the black dot of drawing 964-bit information can be transmitted with 1 symbol data.
[0152]LPF367 and 368 restrict the zone of the multiplier 362 and the digital data of the octal from 363respectivelyand output it to the octal -> binary conversion circuit 372 and 373. Octal -> the digital data of the octal from LPF367 and 368 is changed into a binary by the binary conversion circuit 372 and 373and is supplied to I/F371.
[0153]Drawing 10 is a block diagram showing the A/D conversion in drawing 4and the concrete composition of the clock reproduction part 354.
[0154]The analog signal of the NTSC system from the analog switch box 349 is inputted into the input terminal 385. This analog signal is given to A/D converter 386389the clock generation circuit 390and the synchronizing separator circuit 391. The synchronizing separator circuit 391 is level from the inputted analog video signaland a Vertical Synchronizing signal is separated and it outputs a burst gating signal to the clock generation circuit 390 and 392. The clock generation circuit 390 extracts a burst signal using a burst gating signaland for exampleit was suitable for decoding of the NTSC signala clock 4 times the frequency of chrominance subcarrier frequency (fsc) is generatedand it is outputted to A/D converter 386. A/D converter 386 digitizes an analog video signal using the clock from the clock generation circuit 390and outputs it to I/F387.
[0155]On the other handthe clock generation circuit 392 generates the clock of frequency 8 / 5fsc suitable for the digital signal of teletextand outputs it to A/D converter 389. A/D converter 389 changes a teletext signal into a digital signaland outputs it to the waveform equalization circuit 393. The waveform equalization circuit 393 carries out waveform equalization of the output of A/D converter 389gives it to the data slicing circuit 394and the data slicing circuit 394 slices the output of the waveform equalization circuit 393 on a predetermined leveland it outputs it to I/F395. import declaration387 and 395 output the inputted digital data to the bus 356.
[0156]According to the A/D conversion and clock reproduction part which were constituted in this waythe clock of frequency suitable for the digital processing of a video signal is generated by the clock generation circuit 390. A/D converter 386 digitizes an analog video signal using this clockand outputs it to the bus 356 via I/F387.
[0157]On the other handa clock suitable for the digital signal of teletext is generated by the clock generation circuit 392. A/D converter 389 digitizes a teletext signal using this clock. After waveform equalization of the output of A/D converter 389 is carried out by the waveform equalization circuit 393it is sliced by the data slicing circuit 394 and outputted to the bus 356 via I/F395.
[0158]Thusit makes it possible to supply an NTSC digital video signal and teletext data to the bus 356 at time sharingand to process these signals simultaneously.
[0159]In drawing 4the bus 356 connects each module of each module of a strange recovery module grouppacket depacketizingand a descrambling module group. Packet depacketizing and a descrambling module group are constituted by the

depacketizing descrambling part 401descrambling or the through part 402and the packet part 404. These depacketizing descrambling parts 401descrambling or the through part 402and the packet part 404 are connected to the bus 356 and 404 via I/F.

[0160]Drawing 11 is a block diagram showing the concrete composition of the depacketizing descrambling part 401 in drawing 4.

[0161]The data from the bus 356 is supplied to the error correction circuit 407 and the synchronous control circuit 408 via I/F411. The control signal from I/F411 is supplied to the controller 109. The synchronous control circuit 408 takes the synchronization of the data stream inputtedand a controller controls the error correction processing of the error correction circuit 407 based on a control signal. To the inputted data streamthe error correction circuit 407 gives correction and outputs a predetermined error to the frame synchronization circuit 413. The frame synchronization circuit 413 takes the frame synchronization of the inputted data. The output of the frame synchronization circuit 413 is given to FIFO memory 414and FIFO memory 414 outputs the stored data to the purging processing circuit 415. The purging processing circuit 415 analyzes the inputted data rowand outputs it to the memory control circuit 417. The descrambling processing circuit 416 reads the data row from the purging processing circuit 415performs descrambling processing to the data in which scramble was givenand gives it to the purging processing circuit 415.

[0162]By writing a data row in the memory 418 based on the result by which purging was carried outand readingit separates into the data of image datavoice data graphical dataa computer programetc.and the memory control circuit 417 is outputted to I/F419for example.

[0163]These frame synchronization circuits 413the purging processing circuit 415and the descrambling processing circuit 416 are controlled by the controller 412. That isI/F411 supplies the control signal from the bus 356 to the controller 412. The controller 412 adjusts the frame synchronization timing by the frame synchronization circuit 413 based on the inputted control signaland it changes the contents of processing of the descrambling processing circuit 416. The controller 412 outputs a control signal to the purging processing circuit 415is made to correspond to the received formatand sets up purging processing of predetermined [such as analysis of a header].

[0164]According to the depacketizing descrambling part constituted in this waythe data in which packet data or scramble was given is inputted into the frame synchronization circuit 413 via I/F411and a frame synchronization is taken. The data in which the frame synchronization was taken is supplied to the purging processing circuit 415 via FIFO memory 414and purging processing is performed. The descrambling processing circuit 416 performs descrambling processing to the scramble data of the purging processing circuit 415.

[0165]It is written in the memory 418 by the memory control circuit 417and is readand separates into image datavoice datagraphical dataand other various dataand the data descrambled and analyzed is outputted to the bus 404 via I/F419.

[0166]Thusit becomes possible to decode the data row of a different format.
[0167]or [that descrambling or the through treating part 402 descrambles the digital bit string inputted via I/F from the bus 356 in drawing 4] -- or through processing is carried out and it outputs to the bus 404 via I/F. The packet part 403 packet-izes the digital data inputted via I/F from the bus 404and outputs it to the bus 356 via I/F. These depacketizing descrambling parts 401descrambling or the through treating part 402and the packet part 403 are controlled by the control signal inputted via the bus 404 from the bus controller 348.
[0168]The bus 404 connects each module of packet depacketizing and a descrambling module groupand each module of a decoding encoding module group. A decoding encoding module group The MPEG 2 video decoding part 421The MPEG 2 audio decode part 422NTSCand the EDTV level decode part 423It is constituted by the EDTV vertical decode part 424the MPEG 2 video decoding part 425the MPEG 2 video encode part 426and the MPEG 2 audio encode part 427. Each decode part 421 thru/or 425 and the encode part 426and 427 are connected to the bus 404 and 428 via I/F. An internal parameter is changed based on the decode part 421 thru/or 425 and the encode part 426and the control signal into which 427 is inputted via the bus 428 from the bus controller 348.
[0169]Drawing 12 is the MPEG 2 video decoding part 421 in drawing 4and a block diagram showing the concrete composition of 425. The basic constitution of an MPEG video decoderit is indicated from the Nikkei electronics, the March 14 item, and 77 pages to 92 pages.
145 pages is explained in full detail from the 125-page interface August1992 item. The decoder of drawing 12 is adapted to this example based on these description.
[0170]The MPEG data row from the bus 404 is supplied to the receive buffer 452 via I/F451. After the receive buffer 452 holds the inputted MPEG data row temporarilyit is outputted to the variable-length decoder 453 at a predetermined decoding rate. The variable-length decoder 453 carries out variable-length decryption of the MPEG data rowgives it to the inverse quantizing circuit 454and the inverse quantizing circuit 454 carries out inverse quantization processing of the inputted dataand it outputs it to the inverse DCT circuit 455. The inverse DCT circuit 455 carries out reverse DCT processing of the inputted inverse quantization outputand returns the data of a frequency axis to space-coordinates axial data. The output of the inverse DCT circuit 455 is given to the adding machine 457 and the switch 456. The variable-length decoder 453 outputs the data in which it is shown whether the inputted data row is formed into a frame inner code or interframe coding is carried out to the switch 456and. The data in which the prediction direction in interframe predictive coding is shown is outputted to the switch 464.
[0171]When input data is formed into a frame inner codethe switch 456 chooses the output of the inverse DCT circuit 455and outputs it to the bus 428 via I/F458. When interframe coding of the input data is carried outthe switch 456 chooses the output of the adding machine 457and outputs it to the frame memory 459 and I/F458.

[0172]The frame memory 459 delays one frame period of regenerative data from the switch 456and is given to the frame memory 460the positive prediction device 463and the bidirectional prediction device 462. The frame memory 460 delays one frame period of outputs of the frame memory 459and is outputted to the backward prediction device 461. The positive prediction device 463 is outputted to the switch 464 in quest of an estimated image to a decryption frame by the motion compensation prediction using the decoding data of one frame agoThe backward prediction device 461 is outputted to the switch 464 in quest of an estimated image by the motion compensation prediction using decoding data after [one] receiving a decryption frame. The bidirectional prediction device 462 is outputted to the switch 464 in quest of an estimated image to a decryption frame by the motion compensation prediction using coding data of around one frame. Based on the data in which the prediction direction from the variable-length decoder 453 is shownthe switch 464 chooses the prediction device 461 thru/or the output of 463and outputs it to the adding machine 457.
[0173]In the MPEG decoding part constituted in this waythe MPEG data row inputted via I/F451 is supplied to the variable-length decoder 453 at the back predetermined decoding rate held temporarily at the receive buffer 452. After variable-length decoding is carried out in the variable-length decoder 453in the inverse quantizing circuit 454inverse quantization of the MPEG data row is carried outfurtherinverse quantization of it is carried out by the inverse DCT circuit 455and it is returned to the original space-coordinates axial data.
[0174]When the inputted MPEG data row is formed into a frame inner codethe output of the inverse DCT circuit 455 is supplied to I/F458 via the switch 456and is outputted from the bus 428.
[0175]The reproduced image data from the switch 456 is delayed by the frame memory 459 and 460and is supplied to the prediction device 461 thru/or 463From the prediction device 461 thru/or 463the estimated image by backward prediction and bidirectional prediction and positive prediction is supplied to the switch 464respectively. When interframe predictive coding of the inputted MPEG data row is carried outthe output of the inverse DCT circuit 455 is a prediction error. In this casethe switch 464 chooses the prediction device 461 thru/or the estimated image from 463 based on the data in which the prediction direction is shownand gives it to the adding machine 457. By adding an estimated image and a prediction errorthe adding machine 457 reproduces a frame image and outputs it via the switch 456. In this wayan MPEG data row is decrypted and is outputted to the bus 428 via I/F458.
[0176]In drawing 4the MPEG 2 audio decode part 422 decrypts the audio information of the MPEG system inputted via I/F from the bus 404and outputs voice data to the bus 428 via I/F. NTSC and the EDTV level decode part 423The main screen signal of an NTSC signal or a second generation EDTV signal inputted via I/F from the bus 404 is decodedand the main screen signal which decoded the level reinforcement signal of the second generation EDTV signaland raised horizontal resolution is outputted to the bus 428 via I/F. The EDTV vertical

decode part 424 decodes the vertical reinforcement signal of the second generation EDTV signal inputted via I/F from the bus 404adds it to a main screen signaland is outputted to the bus 428 from I/F.
[0177]Image data is inputted via I/F from the bus 428and the MPEG 2 video encode part 426 codes an MPEG systemand outputs an MPEG data row to the bus 404 via I/F. Voice data is inputted via I/F from the bus 428and the MPEG 2 audio encode part 427 codes an MPEG systemand outputs an MPEG data row to the bus 404 via I/F.
[0178]The bus 428 connects a decoding encoding module group's each module and amplifier 429the graphics controller 431 and the A/D conversion part 434and 436.
[0179]The amplifier 429 amplifies the voice data from the bus 428and outputs an audio signal to the loudspeaker (SP) 430. The GURAFUKKU sconto roller 431 supplies the image data inputted via the bus 428 to the post-processing part 432and the post-processing part 432 performs predetermined graphic processing to the inputted image dataand outputs a picture signal to the monitor 433. The monitor 433 displays the picture based on the inputted picture signaland SP430 outputs the sound based on the inputted audio signal.
[0180]The camera 435 picturizes a picturegives a picture signal to the A/D conversion part 434and the A/D conversion part 434 changes the inputted picture signal into a digital signaland it outputs it to the bus 428 via I/F. The microphone 437 collects soundgives an audio signal to the A/D conversion part 436and the A/D conversion part 436 changes an audio signal into a digital signaland it outputs it to the bus 428 via I/F.
[0181]The bus controller 348 is connected to the memory 438CPU439and remote control I/F440 via the bus 442. The remote control unit 41 outputs the command based on a user's remote control operation to remote control I/F440. Remote control I/F440 transmits the command from the remote control unit 441 to CPU439. The program for controlling decoding of the television set 341 is stored in the memory 438. CPU439 executes the program of the memory 438interprets the command based on remote control operationand opts for operation of the bus controller 348. The memory 438 also has the field which memorizes the data from the bus 404. CPU439 can create the going-up data of CATV and can output it now to the QPSK modulation part 353 via the bus 356 via the bus controller 348.
[0182]Nextoperation of working example constituted in this way is explained with reference to drawing 13 thru/or drawing 20. Drawing 13 thru/or drawing 20 are the block diagrams for explaining the operation corresponding to each broadcast serviceand shows with the slash the module used for each broadcast service.
[0183]Firstthe operation in the case of receiving an NTSC signal with reference to drawing 13 is explained.
[0184]The NTSC signal wave inputted via the input terminal 342 is given to the NTSC tuner 345. The command based on the channel selection operation to a user's remote control unit 441 is interpreted by CPU439and CPU439 outputs the control signal which shows a channel selection channel to the NTSC tuner 345 via the bus controller 348. The NTSC tuner 345 tunes in the signal of the selected

channeland outputs the video signal of baseband to the analog switch box 349.
[0185]In this caseit is controlled by the bus controller 348and the analog switch box 349 chooses the output of the NTSC tuner 345 as an input placeand. The A/D conversion and the clock reproduction part 354 are chosen as an output destination changeand the video signal of the baseband from the NTSC tuner 345 is outputted to an A/D conversion and the clock reproduction part 354. An A/D conversion and the clock reproduction part 354 generate the clock based on the inputted analog signaland they change the video signal of an analog into a digital signal using this clock.
[0186]By the bus controller 348the output of an A/D conversion and the clock reproduction part 354 is supplied to descrambling or the through part 401 via the bus 356and is further supplied to NTSC and the EDTV level decode part 423 via the bus 404. An NTSC signal is decoded in NTSC and the EDTV level decode part 423and is outputted to the bus 428. The bus controller 348 supplies image data to the graphics controller 431and supplies voice data to the amplifier 429.
[0187]Image data is supplied to the monitor 433 as a picture signalafter the post-processing part 432 is supplied and predetermined graphic processing is performed by the graphics controller 431. In this waythe picture based on NTSC broadcast is projected on the display screen of the monitor 433. On the other handthe amplifier 429 amplified voice datathe audio signal is given to SP430and the sound based on NTSC broadcast is outputted from SP430.
[0188]Nextwith reference to drawing 14the operation at the time of teletext reception is explained.
[0189]As the slash of drawing 14 showsat the time of teletext receptionthe bus controller 348 controls the analog switch box 349and supplies the output of the NTSC tuner 345 to an A/D conversion and the clock reproduction part 354. An A/D conversion and the clock reproduction part 354 change a teletext signal into a digital signaland output it to the bus 356. The bus controller 348 supplies the output of an A/D conversion and the clock reproduction part 354 to the depacketizing descrambling part 401 via the bus 356.
[0190]The digital signal of teletext is changed into a predetermined data row from the format of teletext by the depacketizing descrambling part 401and is outputted to the bus 404. The bus controller 348 transmits and stores the data row from the depacketizing descrambling part 401 in the memory 438 via the bus 442. CPU439 reads the alphabetic data stored in the memory 438changes it into image dataand is transmitted to the graphics controller 431 via the bus 428 via the bus controller 348. By the graphics controller 431the image data based on teletext is outputted to the post-processing part 432and the character based on teletext is displayed on the display screen of the monitor 433.
[0191]Nextthe operation in the case of receiving NTSC broadcast and teletext simultaneously with reference to drawing 15 is explained.
[0192]The module shown with the slash of drawing 13 is used for the decode operation of an NTSC signaland the module shown with the slash of drawing 14 is used for the decode operation of a teletext signal. These decodings are the same

as that of the decode operation mentioned above. Such decode operation is performed by time sharingwhen the bus controller 348 transmits data by time sharing.

[0193]The image data based on NTSC broadcast is supplied to the graphics controller 431 via the bus 428 from NTSC and the EDTV level decode part 423the image data based on teletext -- the memory 438 -- the graphics controller 431 is clitteringly supplied via the bus 428. The graphics controller 431 compounds two kinds of image dataand supplies it to the post-processing part 432. In this wayon the display screen of the monitor 433the picture of NTSC broadcast and teletext is displayed simultaneously.

[0194]Nextwith reference to drawing 16the operation at the time of second generation EDTV broadcast reception is explained.

[0195]At the time of second generation EDTV broadcast receptionas shown in the slash of drawing 16a decoding encoding module group's EDTV vertical decode part 424 is chosen out of the module chosen at the time of NTSC broadcast reception. NTSC and the EDTV level decode part 423 separate a level reinforcement signalrecover from the second generation EDTV signal inputted via the bus 404and improve horizontal resolution by adding to a main screen signal. On the other handthe EDTV vertical decode part 424 separates a vertical reinforcement signalrecovers from a second generation EDTV signaland improves vertical definition by adding to a main screen signal. In this waythe main screen signal with which it was level and vertical definition has been improved is supplied and compounded by the graphics controller 431and a picture is reproduced.

[0196]Other operations are the same as that of the time of NTSC broadcast reception.

[0197]Nextwith reference to drawing 17the operation at the time of ISDB broadcast reception is explained.

[0198]Frequency conversion of the ISDB signal inputted via the input terminal 343 is carried out by the ISDB tuner 346. Via the analog switch box 349QPSK demodulation part 351 is suppliedit gets overand the signal by which frequency conversion was carried out is changed into a digital bit stringand is outputted to the bus 356. The bus controller 348 chooses the output of QPSK demodulation part 351and transmits it to the depacketizing descrambling part 401 via the bus 356.

[0199]As for the depacketizing part 401a control signal is supplied from the bus controller 348 via the bus 404and a parameter is changed into ISDB signal formats. Therebythe digital data of ISDB is changed into a predetermined data rowand is outputted to the bus 404. By the bus controller 348a video data is supplied to the MPEG 2 video decoder 421 among the data rows from the depacketizing descrambling part 401and audio information is supplied to the MPEG 2 audio decoder 422.

[0200]A video data and audio information are decoded by these decoders 421 and 422image data is supplied to the graphics controller 431 via the bus 428and voice data is supplied to the amplifier 429 via the bus 428respectively.

[0201]On the other handgraphic-images data is also transmitted in ISDB broadcast. This graphic-images data is supplied and stored in the memory 438 via the bus 404 from the depacketizing descrambling part 401. CPU439 interprets the graphic-images data stored in the memory 438and outputs image data to the graphics controller 431. The image data from the MPEG 2 video decoding part 421 and the image data from the memory 438 are compounded in the graphics controller 431and are supplied to the post-processing part 432. In this wayon the display screen of the monitor 433the display based on digital broadcasting and graphics image data of ISDB is performed.
[0202]Nextwith reference to drawing 18the decode operation corresponding to the multi screen service in ISDB broadcast is explained.
[0203]In this casea decoding encoding module group's MPEG 2 video decoding part 425 is added to the module used at the time of ISDB broadcast reception. That istwo or more video datas outputted from the depacketizing descrambling part 401 are supplied to time sharing the MPEG 2 video decoding part 421 and 425. These MPEG 2 video decoding parts 421 and 425 decrypt the inputted video dataand supply image data to the graphics controller 431 via the bus 428. Two or more image data is compounded by the graphics controller 431and is supplied to the post-processing part 432and the picture of two or more ISDB broadcasts is simultaneously displayed on the display screen of the monitor 433.
[0204]Nextwith reference to drawing 19the decode operation at the time of the existing analog channel reception in digital CATV broadcast is explained.
[0205]The analog signal inputted via the input terminal 344 is inputted into CATV tuner 347. The video signal of the analog tuned in by CATV tuner 347 is supplied to an A/D conversion and the clock reproduction part 354 via the analog switch box 349. Future operations are the same as that of the time of NTSC broadcast reception.
[0206]Nextthe operation in the case of performing two-way communication in digital CATV with reference to drawing 20 is explained.
[0207]It gets down via the input terminal 344a signal is inputtedit goes up via the output terminal 351and a signal is outputted. The going-down signal inputted via the input terminal 344 is tuned in by CATV tuner 347and is supplied to QPSK demodulation part 351 and the 64QAM demodulation section 352 via the analog switch box 349.
[0208]The QPSK demodulation machine 351 restores to inputted CDCchanges it into a digital bit stringand is outputted to the bus 356. Similarlythe 64QAM demodulation section 352 restores to the inputted digital signaland generates a digital bit string. The digital bit string outputted from QPSK demodulation part 351 and the 64QAM demodulation section 352 is supplied to the depacketizing descrambling part 401 via the bus 356and is changed into a predetermined data row.
[0209]CDC is transmitted to CPU439 via the bus 404 among the data rows from the depacketizing descrambling part 401A video data is transmitted to the MPEG 2 video decoding part 421and audio information is transmitted to the MPEG 2 audio

decode part 422. CPU439 controls decode operation based on CDC.
[0210]The MPEG 2 video decoding part 421 decrypts a video dataand the MPEG 2 audio decode part 422 decrypts audio informationand it outputs it to the bus 428. In this waythe image data based on CATV broadcast is supplied to the graphics controller 431and the voice data is supplied to the amplifier 429.
[0211]Other operations are the same as that of the time of analog channel reception of CATV.
[0212]On the other handthe going-up data based on operation of a user's remote control unit 441 is supplied to the QPSK modulation part 353 via the bus controller 348 from CPU439. The QPSK modulation part 353 carries out QPSK modulation of the uphill data. The modulated going-up data is supplied to the CATV modulator 350 via the analog switch box 349and is outputted from the output terminal 351.
[0213]Hereimage data shall be transmitted as going-up data of CATV. The picture signal acquired by the camera 435 picturizing is changed into a digital signal by the A/D conversion part 434and is outputted to the bus 428. The audio signal collected and acquired with the microphone 437 is changed into a digital signal by the A/D conversion part 436and is supplied to the bus 428.
[0214]The image data inputted into the bus 428 is supplied to the MPEG 2 video encode part 426 by the birth control 348and voice data is supplied to the MPEG 2 audio encode part 427. It is coded by these encode parts 426 and 427 with an MPEG systemand image data and voice data are supplied to the packet part 403 via the bus 404respectively.
[0215]The packet part 403 decodes and packet-izes the image data and voice data which were inputtedand these packet data are transmitted to the QPSK modulation part 353 via the bus 356. The QPSK modulation part 353 carries out QPSK modulation of the packet datagoes upconsiders it as dataand is outputted to the CATV modulator 350 via the analog switch box 349. Uphill data is sent out to the cable which it is changed into predetermined frequency and is not illustrated via the output terminal 351 with the CATV modulator 350.
[0216]Thusalso in this examplethe same effect as working example of drawing 1 can be acquired. This example subdivides each function and there is an advantage that common use is further attained rather than working example of drawing 1.
[0217]
[Effect of the Invention]As explained aboveaccording to this inventionmodularize each function required for decodingand. By connecting each functional module by a bus structureit can respond to various broadcast services by low costand has the effect that it can respond to extension of service easily.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The block diagram showing one working example of the television set

concerning this invention.
[Drawing 2]The block diagram showing other working example of this invention.
[Drawing 3]The block diagram showing other working example of this invention.
[Drawing 4]The block diagram showing other working example of this invention.
[Drawing 5]The block diagram showing the concrete composition of the QPSK modulation part 353 in drawing 4.
[Drawing 6]The explanatory view for explaining operation of the QPSK modulation part 353 in drawing 4.
[Drawing 7]The block diagram showing the concrete composition of QPSK demodulation part 351 in drawing 4.
[Drawing 8]The block diagram showing the concrete composition of the 64QAM demodulation section 352 in drawing 4.
[Drawing 9]The explanatory view for explaining the symbol data of 64QAM.
[Drawing 10]The block diagram showing the A/D conversion in drawing 4and the concrete composition of the clock reproduction part 354.
[Drawing 11]The block diagram showing the concrete composition of the depacketizing descrambling part 401 in drawing 4.
[Drawing 12]The MPEG video decoding part 421 in drawing 4and the block diagram showing the concrete composition of 425.
[Drawing 13]The block diagram for explaining operation of working example of drawing 4.
[Drawing 14]The block diagram for explaining operation of working example of drawing 4.
[Drawing 15]The block diagram for explaining operation of working example of drawing 4.
[Drawing 16]The block diagram for explaining operation of working example of drawing 4.
[Drawing 17]The block diagram for explaining operation of working example of drawing 4.
[Drawing 18]The block diagram for explaining operation of working example of drawing 4.
[Drawing 19]The block diagram for explaining operation of working example of drawing 4.
[Drawing 20]The block diagram for explaining operation of working example of drawing 4.
[Drawing 21]The block diagram showing the conventional television set which can receive present NTSC broadcast.
[Drawing 22]The block diagram showing the encoder which generates an NTSC signal.
[Drawing 23]The block diagram showing the conventional television set which can receive teletext.
[Drawing 24]The block diagram showing the encoder which generates a teletext signal.
[Drawing 25]The block diagram showing the encoder which generates a second

generation EDTV signal.
[Drawing 26]The block diagram showing the conventional television set corresponding to a second generation EDTV method.
[Drawing 27]The block diagram showing an ISDB system.
[Drawing 28]The explanatory view showing the layer system of ISDB.
[Drawing 29]The block diagram showing the decoder of ISDB.
[Drawing 30]The block diagram showing the encoder of ISDB.
[Drawing 31]The explanatory view showing the spectrum of the transmission signal adopted as the CATV system which made two-way communication possible.
[Drawing 32]The block diagram showing the decoder of a digital CATV system.
[Drawing 33]The block diagram showing the encoder of a digital CATV system.
[Drawing 34]The block diagram showing the conventional television set corresponding to all the broadcast services.
[Description of Notations]
301 -- A television set and 302 -- A bus and 303 -- NTSC decoding module304 -- A digital-broadcasting receiving module and 305 -- A depacketizing module and 306 -- A digital cable module and 307 -- MPEG video module308 -- An MPEG audio module and 312 -- DMA and 313 --CPU